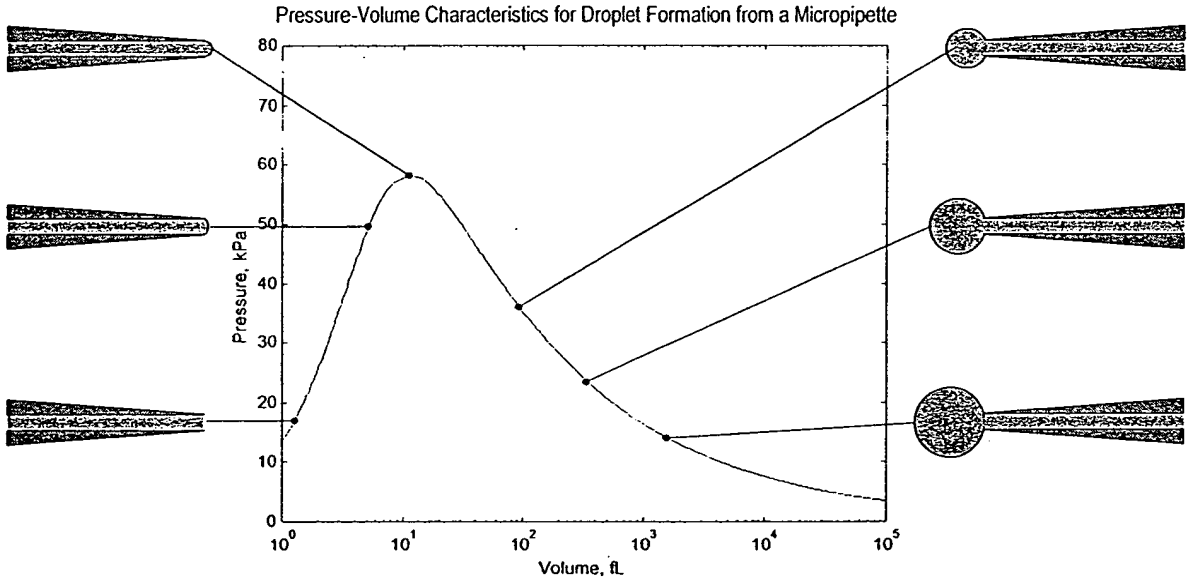
Pressure-Volume Characteristics for Droplet Formation from a Micropipette
Pressure, kPa
Volume, fL
0
10
20
30
40
50
60
70
80
10^0
10^1
10^2
10^3
10^4
10^5

FIG. 1

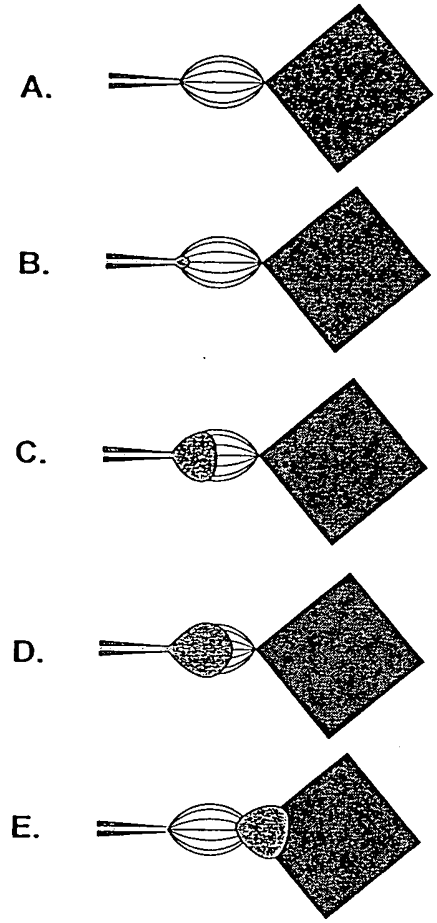

FIG. 2

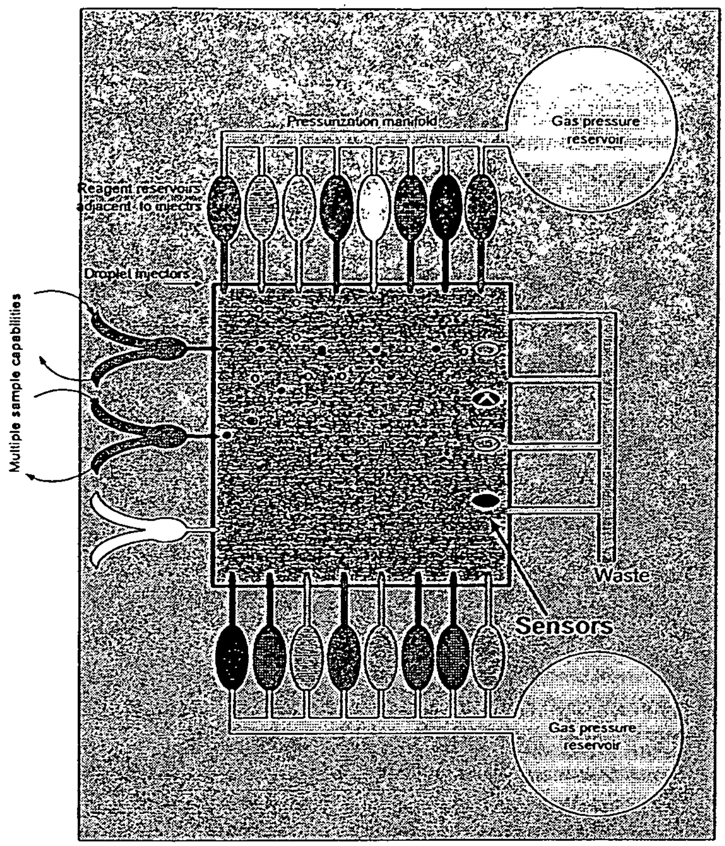

FIG. 3

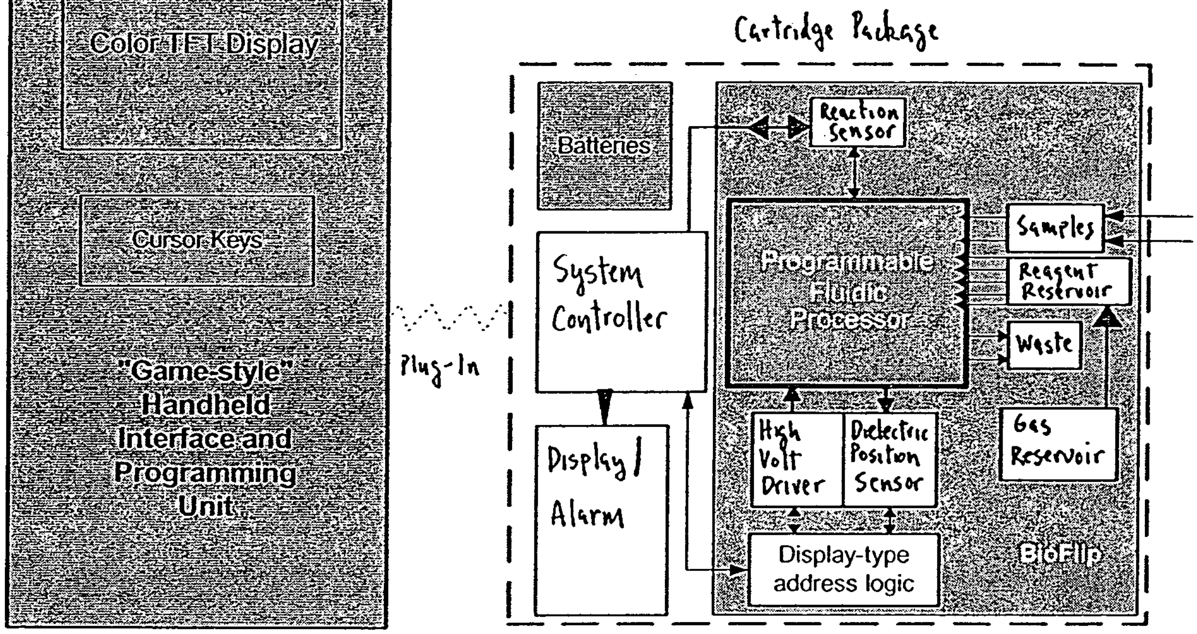
Color TFT Display
Cursor Keys
"Game-style" Handheld Interface and Programming Unit
Plug-In
Cartridge Package
Batteries
System Controller
Display / Alarm
Reaction Sensor
Programmable Fluidic Processor
Samples
Reagent Reservoir
Waste
High Volt Driver
Dielectric Position Sensor
Gas Reservoir
Display-type address logic
BioFlip

FIG. 4

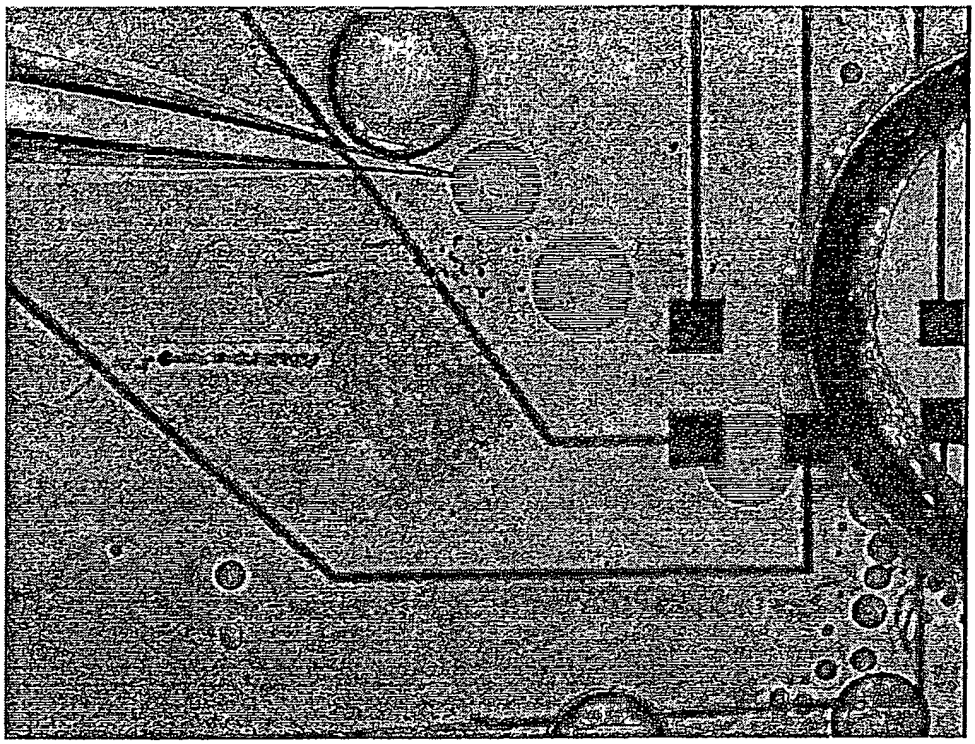

FIG. 5

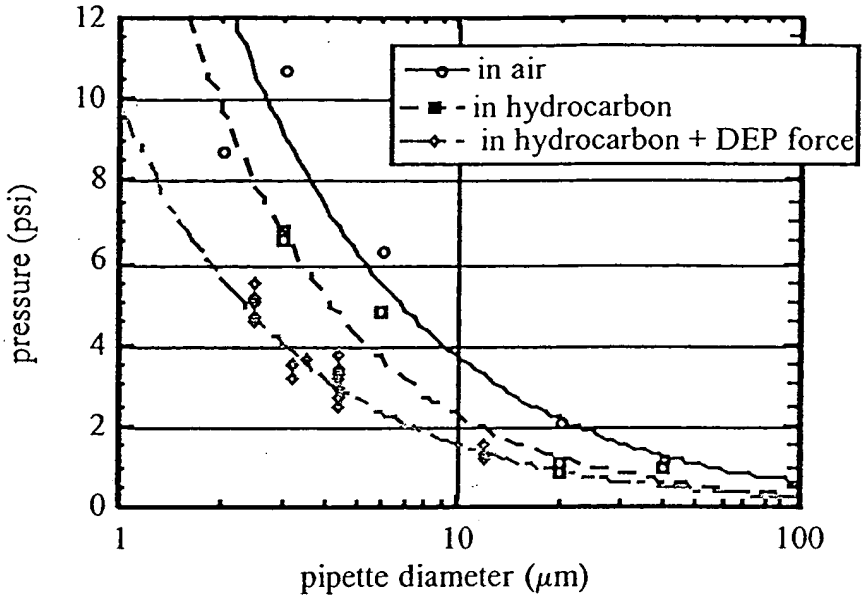
12
10
8
6
4
2
0
pressure (psi)
1
10
100
pipette diameter (μm)
in air
in hydrocarbon
in hydrocarbon + DEP force

FIG. 6

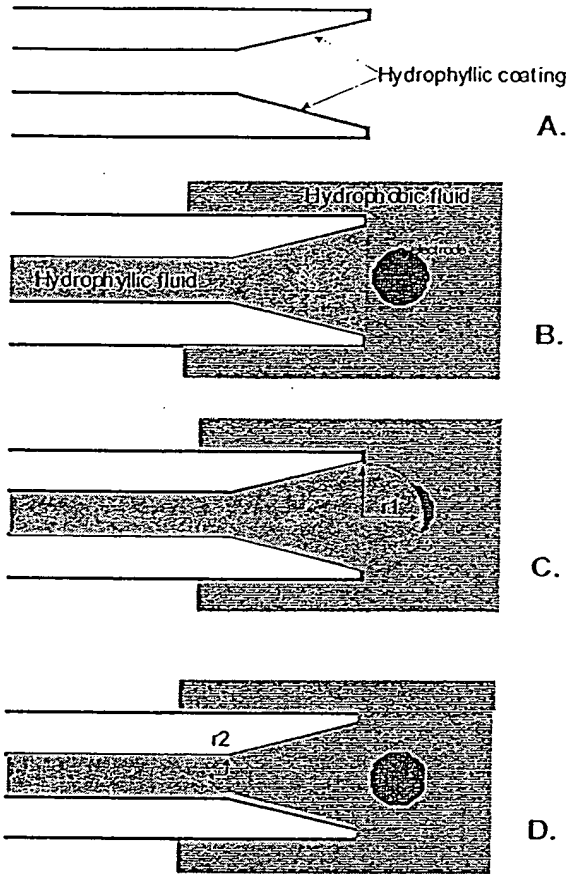
Hydrophyllic coating
A.
Hydrophobic fluid
Hydrophyllic fluid
B.
r1
C.
r2
D.

FIG. 7

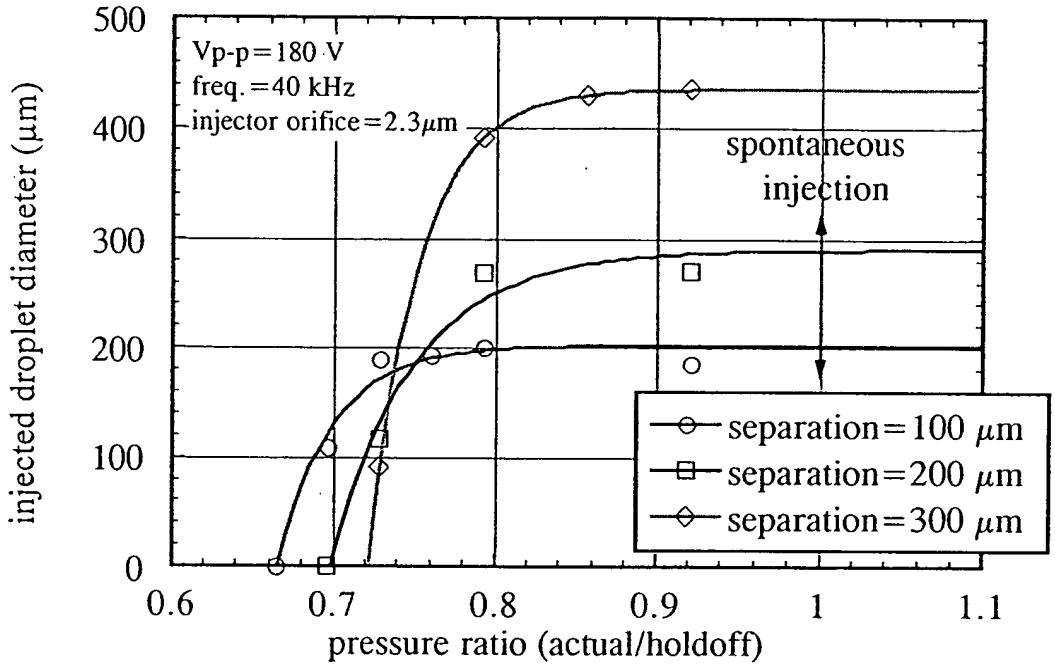
Vp-p=180 V
freq.=40 kHz
injector orifice=2.3μm
spontaneous injection
separation=100 μm
separation=200 μm
separation=300 μm
injected droplet diameter (μm)
pressure ratio (actual/holdoff)
500
400
300
200
100
0
0.6
0.7
0.8
0.9
1
1.1

FIG. 8

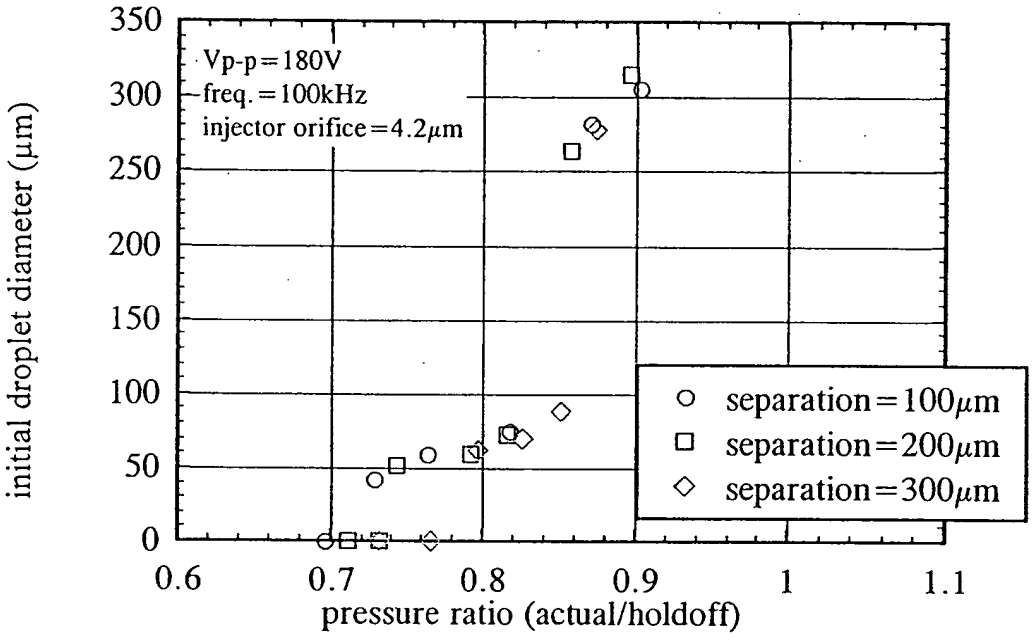
Vp-p=180V
freq.=100kHz
injector orifice=4.2μm
initial droplet diameter (μm)
pressure ratio (actual/holdoff)
separation=100μm
separation=200μm
separation=300μm
350
300
250
200
150
100
50
0
0.6
0.7
0.8
0.9
1
1.1

FIG. 9

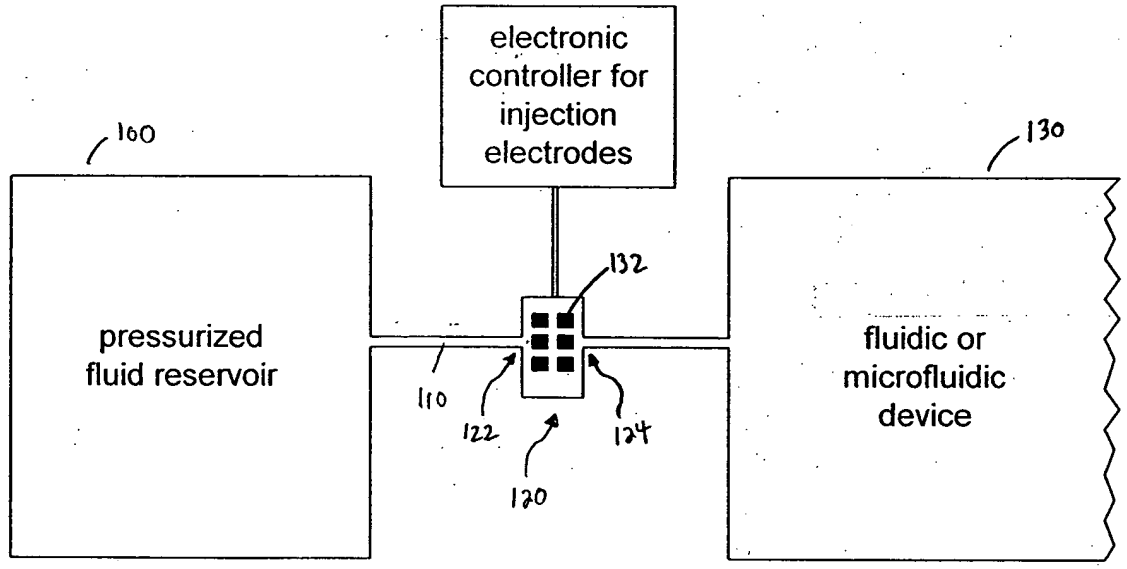
electronic controller for injection electrodes
160
130
132
pressurized fluid reservoir
110
122
120
124
fluidic or microfluidic device

FIG. 10

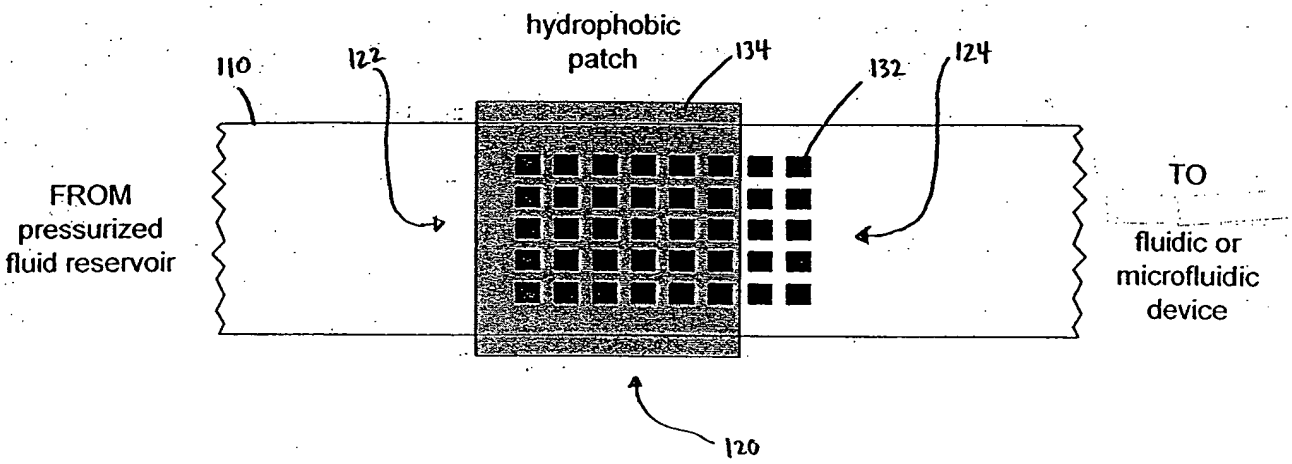
hydrophobic
patch
110
122
134
132
124
FROM
pressurized
fluid reservoir
TO
fluidic or
microfluidic
device
120

FIG. 11

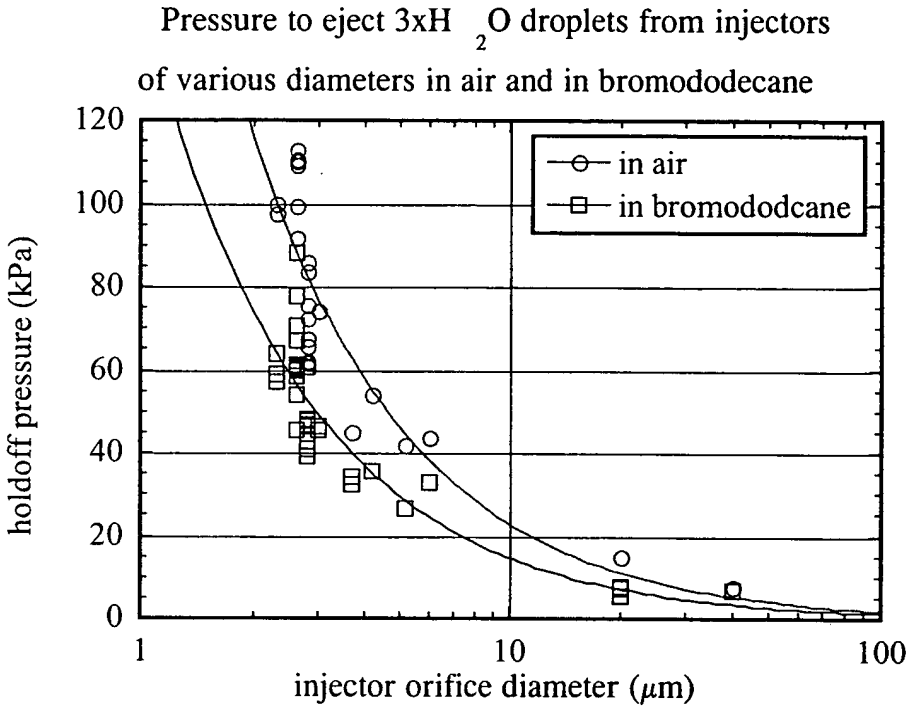
Pressure to eject 3xH 2O droplets from injectors
of various diameters in air and in bromododecane
holdoff pressure (kPa)
120
100
80
60
40
20
0
1
10
100
injector orifice diameter (μm)
in air
in bromododcane

FIG. 12

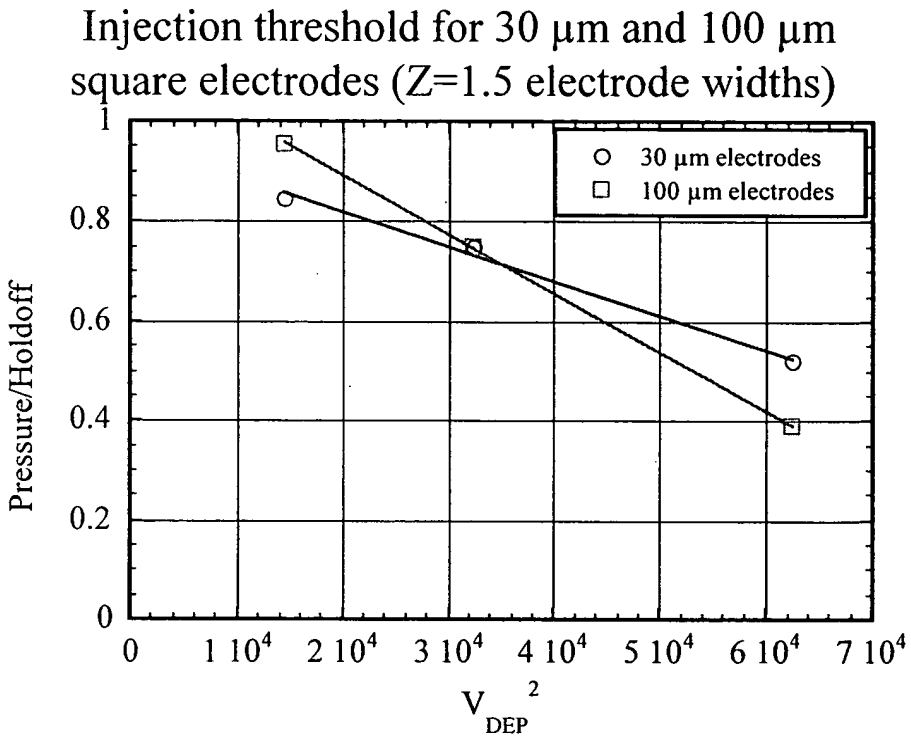
Injection threshold for 30 μm and 100 μm square electrodes (Z=1.5 electrode widths)
Pressure/Holdoff
1
0.8
0.6
0.4
0.2
0
0
1 10^4
2 10^4
3 10^4
4 10^4
5 10^4
6 10^4
7 10^4
V DEP 2
30 μm electrodes
100 μm electrodes

FIG. 13

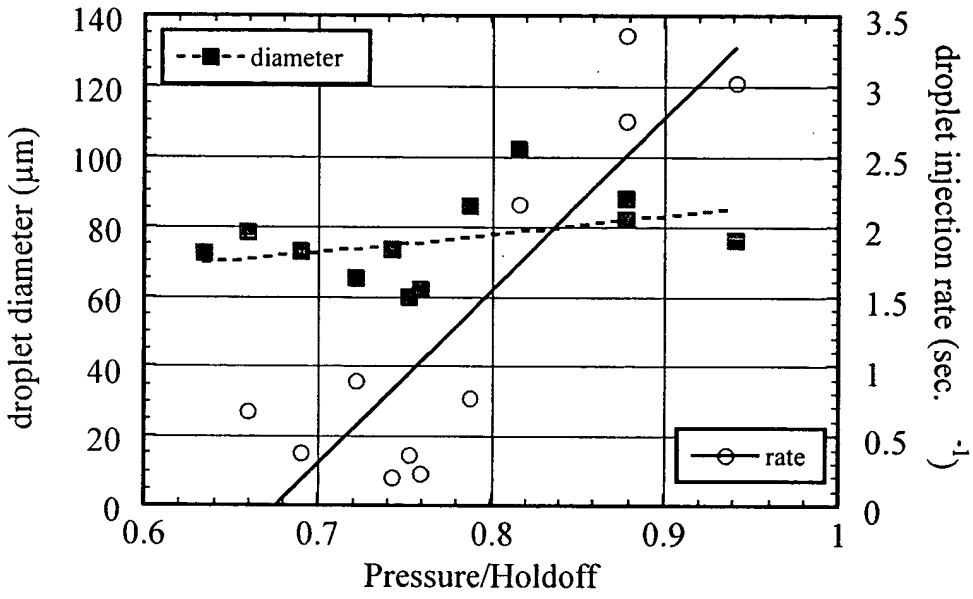
140
120
100
80
60
40
20
0
0.6
0.7
0.8
0.9
1
3.5
3
2.5
2
1.5
1
0.5
0
diameter
rate
droplet diameter (μm)
droplet injection rate (sec. -1)
Pressure/Holdoff

FIG. 14

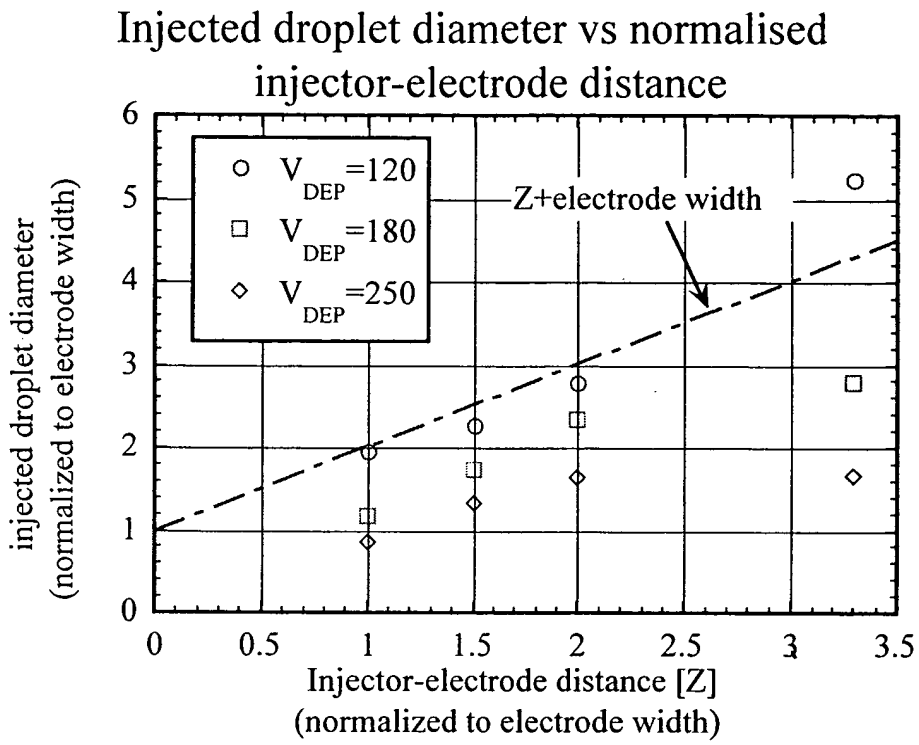
Injected droplet diameter vs normalised injector-electrode distance
injected droplet diameter (normalized to electrode width)
Injector-electrode distance [Z] (normalized to electrode width)
V DEP =120
V DEP =180
V DEP =250
Z+electrode width
0
1
2
3
4
5
6
0
0.5
1
1.5
2
2.5
3
3.5

FIG. 15

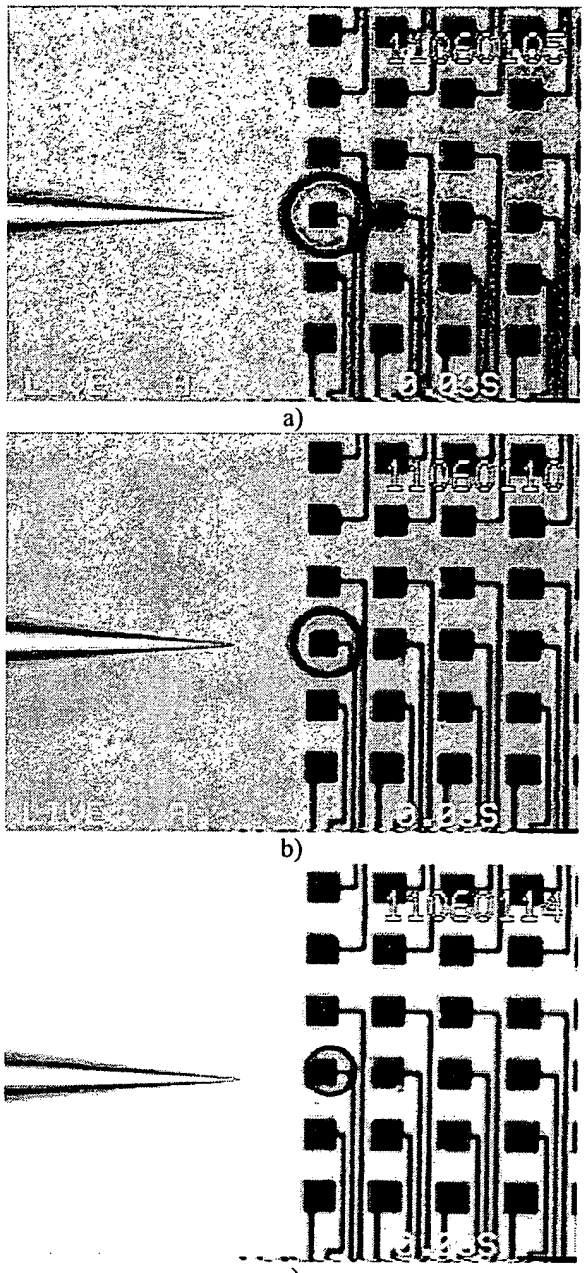

FIG. 16

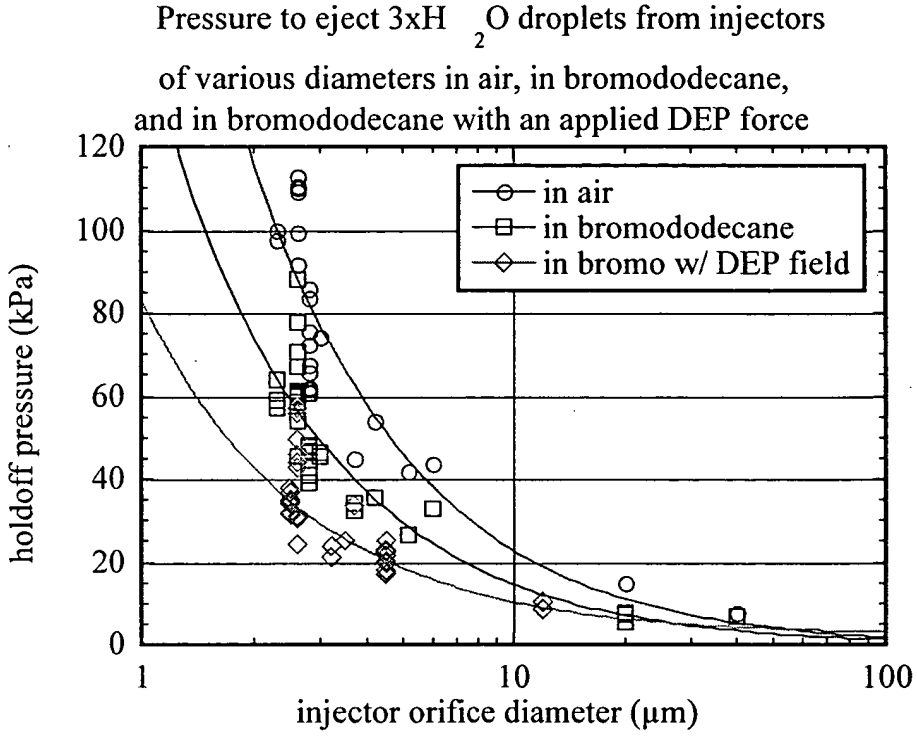
Pressure to eject 3xH 2O droplets from injectors
of various diameters in air, in bromododecane,
and in bromododecane with an applied DEP force
holdoff pressure (kPa)
120
100
80
60
40
20
0
1
10
100
injector orifice diameter (μm)
in air
in bromododecane
in bromo w/ DEP field

FIG. 17

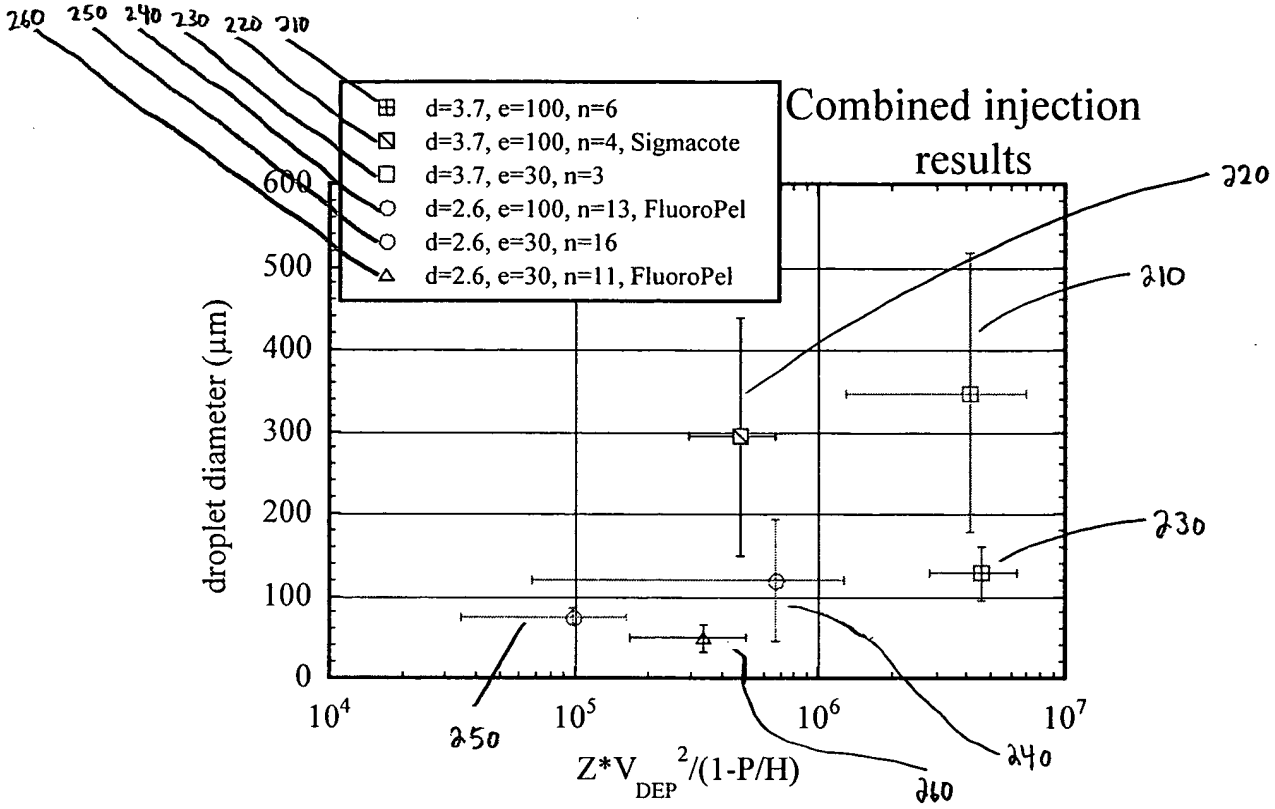
260 250 240 230 220 210
d=3.7, e=100, n=6
d=3.7, e=100, n=4, Sigmacote
d=3.7, e=30, n=3
d=2.6, e=100, n=13, FluoroPel
d=2.6, e=30, n=16
d=2.6, e=30, n=11, FluoroPel
Combined injection results
droplet diameter (µm)
0
100
200
300
400
500
600
10^4
10^5
10^6
10^7
$Z*V_{DEP}^2/(1-P/H)$
220
210
230
250
240
260

FIG. 18

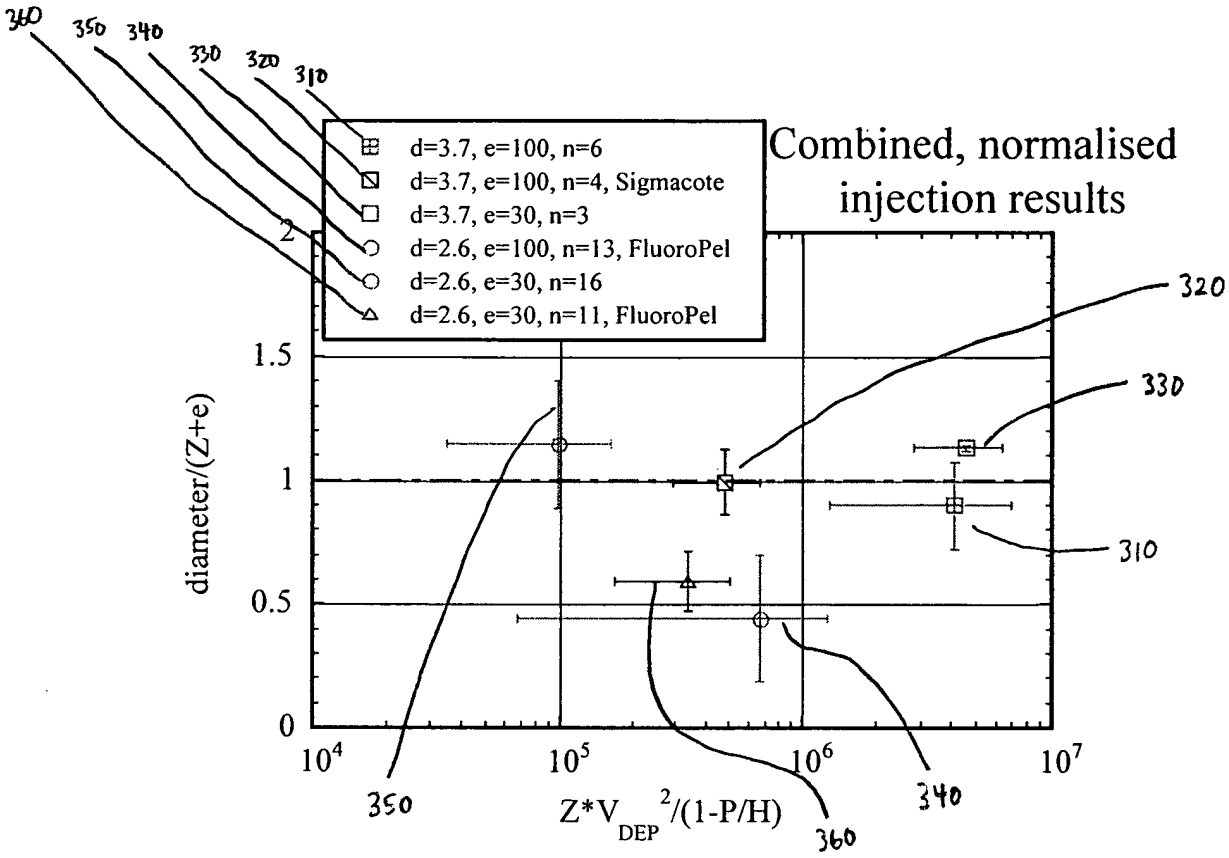
Combined, normalised injection results
d=3.7, e=100, n=6
d=3.7, e=100, n=4, Sigmacote
d=3.7, e=30, n=3
d=2.6, e=100, n=13, FluoroPel
d=2.6, e=30, n=16
d=2.6, e=30, n=11, FluoroPel
diameter/(Z+e)
2
1.5
1
0.5
0
10^4
10^5
10^6
10^7
$Z*V_{DEP}^2/(1-P/H)$
310
320
330
340
350
360

FIG. 19